

STUDIES IN THE GENUS *WATSONIA* MILLER

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ABSTRACT

The *Watsonia meriana* (L.) Miller complex is studied and a new combination proposed. Two locally distinguishable races can be identified with a gradual interflow into the typical *W. meriana* form. Variation is discussed and a distribution map and description are given.

UITTREKSEL

STUDIES IN DIE GENUS *WATSONIA* MILLER

Die *Watsonia meriana* (L.) Miller kompleks word beskryf en 'n nuwe kombinasie word gemaak. Twee plaaslike rasse kan geïdentifiseer word. 'n Inmekaar vloei van die rasse in die tipiese *W. meriana* vind egter plaas. Variasie in die kompleks word bespreek en 'n verspreidingskaart en beskrywing word gegee.

INTRODUCTION

The main object of this paper is to clarify the long existing controversy on the identity of *Watsonia meriana* (L.) Miller, *W. humilis* Miller and *W. coccinea* Herb. ex Klatt.

The identity of each of these species is very vague and this is emphasised when examining determined material in herbaria. In the past species were kept up by a description or a plate. Today extensive fieldwork is done and it is only now that it is realised that variation in plants plays an important role.

During the study of this species complex it was realised that variants of *W. meriana* formed the two last-named species dealt with in this paper.

Extensive variation is experienced throughout the distribution. *W. humilis* Miller and *W. coccinea* Herb. ex Klatt occur as two distinct ecological races throughout the main distribution range where these species occur, and in which the variation is fairly stable. Extensive variation is however experienced within these forms when found not within the range of these ecotypes.

A new combination is thus proposed where *W. humilis* Miller and *W. coccinea* Herb. ex Klatt are now cited as synonyms of *W. meriana* (L.) Miller.

A brief historical background of the three species involved is given to provide a better understanding of the proposed combination.

The possibility of hybridisation is considered in a brief discussion.

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HISTORY

Together with a plate by Ehret, Trew described and published *Watsonia meriana* in his *Plantae Selectae* in 1750. He published it under the name *Meriana florum rubello*.

Miller in the 6th edition of his *Gardeners Dictionary* (1752), published a description of a plant raised by him from seed, as *Watsonia meriana floribus infundibuliformibus subaequalibus*. In the 7th edition of his *Gardeners Dictionary* (1758) Miller published another phrase name for this plant, namely *Watsonia foliis ensiformibus, floribus alternis*. The same year (1758) Miller's *Figures of plants described in the Gardeners Dictionary* was published. Figure 276 of the 2nd volume is this plant. Then in 1768, in the 8th edition of his *Gardeners Dictionary*, he incorporated for the first time the Linnaean binomials naming his plant *Watsonia meriana*. He also published *W. humilis* as a new species with a figure (t.297 f.2).

However, in the 10th edition of the *Systema Naturae* (1759), Linnaeus published the former species (*W. meriana*) with the name *Antholyza meriana* with a reference to Trew's plate (t.40).

In 1762 Linnaeus's *Species Plantarum* ed. 2 was published and again included *Antholyza meriana* mentioning Trew's plate but not Miller's for Linnaeus would not recognise it as *Watsonia* but only as a part of *Antholyza*.

The 12th edition of the *Systema Naturae* was published in 1767 and Linnaeus cited Miller's *W. humilis* as a synonym for his *Antholyza meriana* var. β minor. Linnaeus believed that *W. humilis* Miller was a smaller form of his *A. meriana*.

Burman f. in the *Prodrum* to his *Flora Indica* based his *Antholyza meriana* on the same type as Linnaeus's *A. meriana* (Trew, t.40).

Linnaeus published his second *Mantissa* in 1771 and included Miller's *W. humilis* under *Antholyza meriana*, as he had decided it had no taxonomic rank at all.

However, in the 13th edition of Linnaeus's *Systema Vegetabilium* (1774) he mentioned Miller's *Watsonia meriana* as a synonym of his *Antholyza meriana* and with a detailed description published *Antholyza merianella*, citing Miller's *W. humilis* (t.297 f.2). He thus continued his refusal to recognise the genus *Watsonia*, but he did now recognise Miller's two species. The plant which he used for his description was what he believed to have been the same as Miller's *Watsonia humilis* but it was in fact a specimen of *Homoglossum merianella* (Milne-Redhead, 1938), a plant which is kept in the LINN-herbarium as No. 60.7 (De Vos, 1976).

Houttuyn published his *Natuurlijke Historie* in 1780 and cited Miller's plates for *Antholyza meriana* and for *Antholyza merianella*.

Murray published the 14th edition of the *Systema Vegetabilium* in 1784, incorporating all the new species from the *Supplementum* and in this edition

Miller's *W. meriana* and *W. humilis* were cited for his *Antholyza meriana* and *Antholyza merianella* respectively.

Thunberg's *Dissertatio de Gladiolo* was published the same year; he did not recognise Miller's genus *Watsonia*, nor did he recognise *W. meriana* and *W. humilis* as members of the genus *Antholyza* as Linnaeus had, but placed *Watsonia* species described to date in the genus *Gladiolus*. *Watsonia meriana* thus became *Gladiolus merianus* and *Watsonia humilis* became *Gladiolus marginatus* var. *sanguineus*.

Aiton in the first edition of the *Hortus Kewensis* accepted Linnaeus's *Antholyza meriana* and *Antholyza merianella*.

Jacquin's *Icones Plantae Rariores* was published between 1789 and 1797 and he too suppressed the genera *Antholyza* and *Watsonia*. Plate 229 is that of *Watsonia meriana* and plate 231 *Watsonia humilis*, but the latter was named *Gladiolus laccatus*.

In 1794 Thunberg's *Prodromus Plantae Capensis* appeared and in this he now only mentioned *Gladiolus merianus* and not *Gladiolus marginatus* var. *sanguineus* which was mentioned before by him in his *Dissertatio de Gladiolo*.

Willdenow in the *Species Plantarum* ed. 4 (1797) mentioned *Gladiolus merianellus*, *Gladiolus merianus* and *Gladiolus laccatus*. Only *G. merianellus*, a synonym for *W. humilis*, is related to this paper, as with *G. merianus* he cited several non-relevant species and his *G. laccatus* is a *Homoglossum*.

Curtis had by now started publishing his *Botanical Magazine* but it was only in 1798 that he described and figured the first *Watsonia* under the name *Antholyza meriana*. Ker however, in 1803, accepted the genus *Watsonia* and described *W. humilis*.

Ker in the 1st volume of König & Sims *Annals of Botany* (1805) revised the now accepted genus *Watsonia* naming *W. meriana* and *W. humilis*. In Curtis's *Botanical Magazine* of 1809 he published as t.1195 what he (Ker) believed to be a variety (β) of of *Watsonia humilis* and as t.1194 a small form of *Watsonia meriana*.

In 1809 Willdenow in his *Enumeratio plantarum horti Berolensis* still referred *W. meriana* to the genus *Gladiolus*; Aiton however in the 2nd edition of *Hortus Kewensis* accepted the genus *Watsonia*.

The 6th volume of Redouté's *Les Liliacées* was published in 1812. His *Gladiolus laccatus* is a synonym for *W. humilis*.

Sweet (1818) accepted both the genus *Watsonia* and the two species in his *Hortus suburbanus Londinensis* but Link referred these plants to the genus *Ixia* in his *Enumeratio Hortus Berolinsis* (Lewis, 1962).

Sweet in 1827 published his revision of the genus *Watsonia* in the *Hortus Britannicus* and cited Ker's *W. humilis* var. β as a form of *W. humilis* with no rank.

Klatt in *Linnaea* 32 agreed with this but later changed his mind, for in 1882

when he published his *Ergänzungen*, he used *W. humilis* var. β (t.1195, of the *Botanical Magazine*) as a reference to his *W. maculata* and validated the name *W. coccinea*, with t. 1194 as type, as proposed by Herbert in his MS.

Baker published his much needed revision of the long neglected *Iridaceae* in the 16th volume of the *Journal of the Linnaean Society* in 1877. Here he treated *W. meriana* and *W. humilis* as distinct species, with *W. coccinea* as a variety of *W. meriana*.

In the *Handbook of Irideae* he raised *W. coccinea* to specific level and did so again in 1896 in Thyselton-Dyer's *Flora Capensis*.

It is thus clear that a great deal of confusion existed amongst botanists. Plants already described and variants of these were in many cases given new names.

The last work, Baker's revision in 1896, gave each of these three species specific rank but today more is known about the distribution, ecology and variation of these plants.

During the study of the three species involved an attempt was made to keep them on either specific or varietal level, but no character/s occur in this complex to separate them from one another. Baker's concept of species involved could therefore not be upheld.

DISTRIBUTION

The northernmost distribution of *W. meriana* is on the higher parts of the Kamiesberg and it then stretches further south along the coastal belt and interior west of the Bokkeveld and Sederberg down into the South-Western Cape and as far east as Bredasdorp. (Fig. 1).

The species is found through a range of vegetation and soil types and this together with climatological conditions has resulted in two almost distinct races.

THE TYPICAL *WATSONIA MERIANA* (L.) MILLER FORM

This more common large form of *W. meriana* is regarded as the typical form as it corresponds best to Trew's plate (t.40) and that of Miller (t.276). Linnaeus cited t.40 for his *Antholyza meriana* and it is in fact the lectotype of *W. meriana*.

This form inhabits the dry karroid conditions in the most northern limits (3018—Kamiesberg) of its distribution as well as in the south-eastern (3119—Calvinia and 3319—Worcester) limits of its distribution. It also ranges through renosterbos and sandveld on the coastal belt (3218—Clanwilliam) and parts of the interior (3318—Cape Town) of the south-western Cape.

The plants grow in a variety of soil types. Old granite is represented in the Kamieskroon district, with the Dwyka Series of the Karoo System on the escarpment between Nieuwoudtville and Vanrhynsdorp. Coastal sands on the westcoast and sand derived from the Table Mountain Series are found in the interior south of Klawer and are mainly confined to the mountain ranges that



FIG. 1.
Distribution of *Watsonia meriana* (L.) Miller.

- - The typical *Watsonia meriana* (L.) Miller.
- - The "*Watsonia humilis*" race.
- ▲ - The "*Watsonia coccinea*" race.

stretch down to the coast at Hermanus in the south. Malmesbury Shale is found from Piquetberg to south of Malmesbury, as well as the flats and lower foothills between Worcester and Robertson.

Although classified as a winter rainfall region, rain is frequent throughout the year with the main precipitation occurring between June and August. An average rainfall of between 200 and 250 mm p.a. is recorded in the northern regions with the exception of over 300 mm on the Nieuwoudtville escarpment. From Malmesbury south to the Cape Flats (3318—Cape Town) 450–550 mm p.a. is recorded.

The plants which grow in areas where water may collect in shallow pans during the rainy season are taller than those from drier areas; a fair amount of variation is found throughout the distribution.

This deciduous species grows mainly in small clusters, rarely as individuals, and large masses are found in seasonally moist, almost vlei conditions in the Darling area. In these colonies the plants usually have narrow erect leaves, whereas plants from the drier parts and sandveld usually have broad ensiform leaves spreading in a fan shape. Leaves in the karroid areas usually have much thickened prominent margins.

Corms are usually large and tunicated with a hard coarse fibre which forms several layers.

A colony of the dwarf form of the typical *W. meriana* is found in the sandveld on the farm "Kleindiamant" south of Malmesbury and here the plants tend to grow more as separate individuals.

This form flowers from September to October.

A diploid chromosome number of 18 (Goldblatt, 1971) is present in this typical form.

DISTINGUISHABLE RACES

Watsonia humilis Miller and *Watsonia coccinea* Herb. ex Klatt are regarded as separate races. The reason for this is that these formerly two separate species are only distinguishable by their distribution and flower colour.

The "*W. humilis*" race is found on the Cape Peninsula with only one known colony in the sandveld between Cape Town and Malmesbury where it grows in temporary wet conditions which are only slightly saline. In this colony the plants are taller and flower earlier than those on the higher altitudes, and flowers are pale translucent pink.

This form grows in conditions which are wet for almost the entire year. At Cape Point, at an altitude of 150 m, it is fairly common. It is also common at Woodhead on Table Mountain at an altitude of 747 m. The rainfall increases from 333 m at Cape Point to 1 620 mm p.a. at Woodhead.

Plants of this race usually grow as separate individuals scattered over large areas. The leaves in most cases are short, linear, erect or spreading. The spike can be simple or branched. A simple spike can consist of as few as 2 flowers and a

branched spike with as many as 10 flowers. The corm is small and tunicated with fine fibre which forms several layers.

Collections made at Bergvliet and Kenilworth are much taller with long erect linear leaves and compare well with the colony in the sandveld north of Cape Town.

Flowering occurs from October to November at the higher altitudes. The flowers are pink (Royal Hort. Soc. colour chart No. 55b) throughout the race. Capsules are broad ellipsoid in cases where plants are found in the wetter areas but become longer and narrower in drier conditions. Seed is shed in March and April.

Goldblatt (1971) reported a diploid chromosome number of 18 in this race.

The "*Watsonia coccinea*" race occurs in the southern distribution range of this species complex and is distinct from the typical *W. meriana* as it always grows individually and never forms clusters. The soils derive mainly from Table Mountain and Bokkeveld Series with limestone south-east of Bredasdorp.

Rainfall measures from 470 mm at Bredasdorp at an altitude of 67 m, to 920 mm at Highlands at an altitude of 366 m.

The conditions in which the race is found, are very marshy for most of the year but tend to dry out completely to the south. The plants are relatively stable under these conditions, but are more slender with longer and narrower leaves at higher altitudes when growing in drier conditions. Plants are scattered as individuals over vast areas.

The small corm is tunicated with fine fibre. Plants growing in drier conditions tend to have bigger corms.

The flowering period is from September to October and the colour is always orange (Royal Hort. Soc. colour chart No. 33a). Frequent burning improves flowering. Seed capsules are broad ellipsoid.

HYBRIDISATION

Continual variation might lead to the idea that hybridisation may occur. But, in the many collections made and in the colonies studied in areas where the *W. humilis* and *W. coccinea* races occur, the author has observed no significant variation in single colonies to suggest that more than one parent could be involved.

Seedset is good in all populations investigated.

Plants of the typical *W. meriana* collected in the veld in most cases show little variation or change when brought into cultivation. Exceptions, as in the case of *W. meriana* (dwarf form) which when cultivated increased considerably in size, do occur. This is also the case with "*W. coccinea*" race when corms were brought into cultivation or when raised from seed.

Plants raised from seed showed no extensive degree of variation. In the case of an F₂ hybrid population a maximum of $\pm 12\%$ of the plants should show some form of original parentage which in this case did not occur.

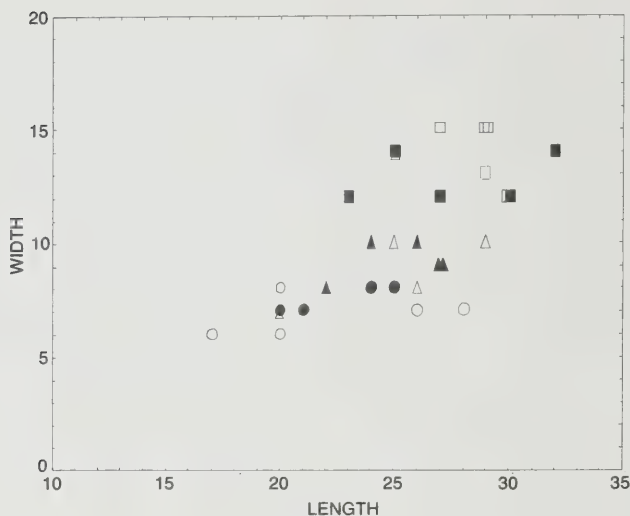


FIG. 2.

Variation of bracts and bracteoles in the three *Watsonia meriana* races.

Typical *W. meriana*.

- – Bracts
- – Bracteoles

'*W. humilis*' race.

- – Bracts
- – Bracteoles

'*W. coccinea*' race.

- △ – Bracts
- ▲ – Bracteoles

The possibility that F1 hybrid populations do occur is remote. The author believes it is not possible for a hybrid population, for instance in the case of '*W. coccinea*', to stretch over a distance of ± 120 km.

Also the absence of possible parent plants throughout the distribution area leads one to believe that these *Watsonias* are ecological forms.

VARIATION

Due to the large amount of variation in the vegetative parts of this complex it was impossible to work on any vegetative characters. The floristic parts, e.g. bracts, bracteoles and the outer and inner perianth segments were used to plot the variation as these proved to vary only slightly.

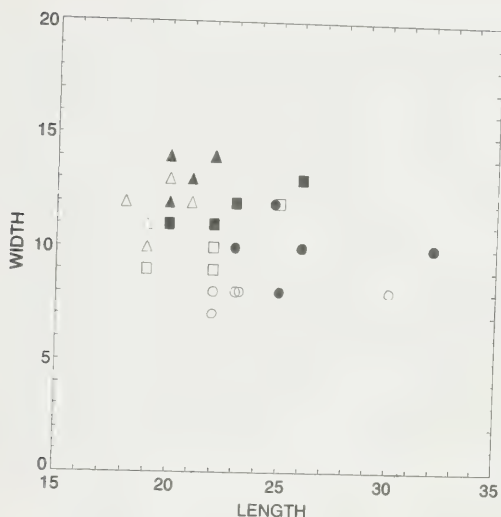


FIG. 3.

Variation of the outer and inner perianth segments in the three *Watsonia meriana* races.

Typical *W. meriana*.

○ – Outer segments

● – Inner segments

“*W. humilis*” race

□ – Outer segments

■ – Inner segments

“*W. coccinea*” race

△ – Outer segments

▲ – Inner segments

Figure 2 shows the variation of the bracts and bracteoles of five specimens of each of the three forms. The typical form of *W. meriana* from Darling, the “*W. humilis*” race from Steenberg plateau and the “*W. coccinea*” race from Betty’s Bay were used.

Figure 3 shows the variation of the outer and inner perianth segments of the same forms from the same localities used in Figure 2.

The interflow of characters in the three forms is clearly visible which makes it thus impossible to separate them on specific or varietal level. They can be regarded as locally distinguishable races only.

SYSTEMATICS

Watsonia meriana (L.) Miller, Gard. Dict. ed. 8, Ic.2: 184, t.276 (1768); Ker in König & Sims Ann. 1: 230 (1805); Ait. in Hort. Kew. ed. 2, 1: 95 (1810); Sweet, Hort. sub. Lond. t.10 (1818) & Hort. Brit. ed. 2: 500 (1830); Klatt in Linnaea 32: 739 (1863) & Ergänzt. 17 (1882); Bak. in J. Linn. Soc. Bot. 16: 158 (1877) & Handb. Irid.: 175 (1892) & in Fl. Cap. 6: 101 (1897).

Antholyza meriana L., Syst. Nat. ed. 10.: 863 (1759) & Mant. Plant.: 320 (1771); Burm. f., Fl. Cap. Prod.: 1 (1768); Hoult. in Nat. Hist. 2(12): 59 (1780); Murray in L. Syst. Veg.: 86 (1784); Ait. in Hort. Kew. ed. 1: 67 (1789); Curtis, Bot. Mag. t.418 (1798).

Antholyza meriana var. β *minor* L., Syst. Nat. ed. 12: 77 (1767).

Watsonia humilis Miller, Gard. Dict. ed. 8, Ic.2: 198, t.297, f.2 (1768); Ker in Bot. Mag. t.631 (1803) & in König & Sims Ann., 1: 230 (1805); Ait. in Hort. Kew. ed. 2, 1: 94 (1810); Sweet, Hort. sub. Lond. t.10 (1818) & Hort. Brit. ed. 2: 500 (1830); Klatt in Linnaea 32: 739 (1863) & Ergänzt.: 17 (1882); Bak. in J. Linn. Soc. Bot. 16: 158 (1877) & Handb. Irid.: 176 (1892) & in Fl. Cap. 6: 102 (1897).

Antholyza merianella Hoult. in Nat. Hist. 2(12): 61 (1780) non L.; Murray in L. Syst. Veg. ed. 14: 87 (1784) non L.; Ait. in Hort. Kew. ed. 1: 67 (1789) non Murray.

Gladiolus marginatus var. τ *sanguineus* Thunb., Diss. Glad.: 18 (1784) non L.f.

Gladiolus merianus Jacq., Ic. Plant. Rar. 2, t.229 (1789); Red., Lil. 1: 11, t.11 (1802); Willd., Enum. plant. Berol.: 60 (1809); Thunb., Fl. Cap. ed. Schultes: 40 (1823) excl. syn. Jacq.

Gladiolus laccatus Jacq., Ic. Plant. Rar. 2, t.231 (1789); Red., Lil. 6: 343, t.343 (1812).

Gladiolus merianellus Willd. Sp. Plant. 1: 214 (1797) excl. syn. L.

Watsoina meriana var. τ Ker in Bot. Mag. t.1194 (1809).

Watsonia humilis var. β Ker in Bot. Mag. t.1195 (1809).

Ixia meriana Link, Enum. hort. Berol. 1: 52 (1821) f. Lewis.

Watsonia maculata Klatt, Ergänzt.: 17 (1882).

Watsonia meriana (L.) Miller var. *coccinea* Herb. ex Bak. in J. Linn. Soc. Bot. 16: 158 (1877).

Watsonia coccinea Herb. ex Klatt, Ergänzt.: 18 (1882); Bak. in Handb. Irid.: 175 (1892) & in Dyer's Fl. Cap. 6: 101 (1896).

Pre Linnaean:

Meriana florae rubello Trew, Plant. Selec.: 11, t.40 (1750).

Watsonia meriana floribus infundibuliformibus subaequalibus Miller, Gard. Dict. ed. 6, Ic.4 (1752).

Watsonia foliis ensiformibus, floribus alternis Miller, Gard. Dict. ed. 7, Ic.2, t.276 (1759).

Plants very variable in size. *Corm* 40–70 mm diam., with neck to 60 mm long; densely tunicated with hard, coarse, pale to dark brown fibre which forms 3–5, often more layers. *Stem* erect, firm and usually not flexuose, often simple in dwarf forms but usually with 1–7 erect, often flexuose branches, stem 220–1 380 mm tall. *Leaves* herbaceous and distichous and spread fan-shaped to erect, firm, 2–7 but usually 4, ensiform to linear, leaves with thickened midrib which is generally not very prominent, venation distinct, margins slightly, often much thickened, 110–730 mm long $\times$ 4–44 mm wide. *Cauline leaves* 2–4, ensiform to linear, sheathing stem for most of its length, lower cauline leaves inflated, upper sheathing, often overlapping. *Spike* to 440 mm long, simple or branched, often flexuose, 1–7 branches, erect, distichous; main spike dense to lax, to 440 mm long, 1–17 flowered. *Bract* 17–38 mm long $\times$ 5–13 mm wide, herbaceous with apex usually dried out, bracts not overlapping, clasping stem at base only, usually shorter than bracteoles but often as long, lanceolate, acute to obtuse often emarginate. *Bracteole* 12–39 mm long $\times$ 6–11 mm wide, usually longer than bracts, herbaceous to membranous with apex usually dried out, lanceolate, acute to obtuse, often bidentate. *Perianth tube*: basal part filiform, straight or slightly curved, widening only slightly, 13–34 mm long, upper part cylindrical, curved and slightly widening, 20–35 mm long. *Segments*: outer, obovate to elliptic, 19–30 mm long, 6–17 mm wide; inner, obovate, 19–32 mm long $\times$ 7–15 mm wide. *Stamens* 33–70 mm long, arcuate. *Staminodes*: absent in this species of *Watsonia*. *Anthers* 6–12 mm long, linear saggitate, all facing lower perianth segment. *Ovary* obovate, 3–6 mm long, 2–3 mm diam. *Style* filiform, 62–88 mm long, pale. *Stigmatic branches* filiform, 4–7 mm long, linear, obtuse, often overtopping anthers. *Capsule* 36–55 mm long $\times$ 9–11 mm diam., narrow to broad ellipsoid.

Flowers from September to November. Colour range recorded, Royal Hort. Soc. colour chart no. 19d, 26a, 28a, 29a, 29c, 30c, 31a, 36a, 37a, 38c, 41d, 45a, 45b, 48a, 49a, 55a, 56a, 56c.

SPECIMENS EXAMINED

CAPE—3018 (Kamiesberg): Kamiesberg, Little Namaqualand (-AC), *s.n.* NBG 1813/32 (BOL); Kamiesberg between Garies and Leliefontein, *Esterhuysen* 1394 (BOL); Welkom, Kamiesberg near Garies, *Esterhuysen* 23719 (BOL); Garies (-CA), *Horn s.n.* (NBG 61837).

—3118 (Vanrhynsdorp): Between Vanrhynsdorp and coast (-DA), *Pillans s.n.* (BOL); Gifberg, Vanrhynsdorp (-DC), *Phillips* 7517 (SAM); Gifberg, Vanrhynsdorp, *Phillips* 7627 (NBG).

—3119 (Calvinia): Nieuwoudtville, Calvinia (-AC), *Compton s.n.* NBG 61833 (NBG).

—3218 (Clanwilliam): Graafwater, Clanwilliam Div. (-BA), *Zinn s.n.* SAM 59721 (SAM); Sandveld between Grey's Pass and Graafwater, *Leipoldt* 3574

(BOL); Olifants River Valley, 5 miles N. of Citrusdal (-BB), *Lewis* 1368 (SAM); Brandberg, between Sandberg and Graafwater (-BC), *Rourke* 1566 (NBG); Marsh on N.E. margin of Verloren Vlei (-DA), *Pillans* 7799 (BOL); Scherpeheuvelsberg near Grey's Pass, *Leipoldt* (SAM); Near Sauer, Piquetberg (-DC), *Barker* 8089 (NBG); South of Sauer in dry sandy soil (-DD), *Lewis* 3559 (SAM).

—3219 (Wuppertal): Brakfontein, between Citrusdal and Hex River (-CA), *Bolus* (BOL).

—3318 (Cape Town): Rocky hill S. of Langebaan (-AA), *Pillans* 6700 (BOL); 2 miles from Ysterfontein, *Hall* 162 (NBG); Hopefield (-AB), *Middlemost* s.n. NGB 61842 (NBG); Farm "Oubos" near Darling (-AD), *Roux* 201 (NBG); At turnoff to Darling from Cape Town. Malmesbury road (-BC), *Roux* 199 (NBG); Junction to Malmesbury, Darling-Mamre road, *Roux* 202 (NBG); 15 km. E. of Mamre Rd. station, along road (-CB), *Roux* 200 (NBG); Sandy flats between Malmesbury and Darling, *Pillans* 6709 (BOL); Klaver Vlei, Darling, s.n. BOL 19150 (BOL); Darling, s.n. 430/14 NBG (BOL); Mamre, *Bolus* (BOL); Camps Bay, Cape Town (-CD), *Zeyher* s.n. SAM 48529 (SAM); 18 miles from Cape Town along Melkbosch road (-CD), *Lewis* (SAM); Kenilworth race course, *Lewis* 478 (SAM); Melkbosch road, *Olivier* s.n. NGB 61835 (NBG); Kenilworth race course, *Lewis* 56 (SAM); Table Mountain, W. side of upper plateau, *Stokoe* (SAM); Kenilworth race course, *Cross* 75 (SAM); Table Mountain, between Kasteels Poort and Woodhead, *Roux* 250 (NBG); Flats near College Range, *Wolley Dod* 642 (BOL); Rosebank, s.n. BOL 3800 (BOL); Table Mountain, s.n. 1790/25 NBG (BOL); Hely Hutchinson Reservoir (-CD), s.n. 1789/25 NBG (BOL); Table Mountain, *Taylor* 1303 (BOL); Table Mountain, near Woodhead, *Goldblatt* 405 (BOL); Claremont Flats, *Mathews* (BOL); Kenilworth race course, *Esterhuysen* 32054 (BOL); Rapenburg, Mowbray, *Guthrie* 132 (BOL); Killarney Flats, *Lewis* 5553 (NBG); Camp Hill Village turnoff, 20 km. S. of Malmesbury, *Goldblatt* 2320 (NBG); Table Mountain, *Pillans* 1253 (BOL); Kuils River (-DC), s.n. 2141/27 NBG (BOL); Between Stellenbosch and Paarl, *Ryder* (BOL); Kraaifontein, *Robinson* s.n. SAM 61845 (SAM); Joostefontein Paarl Div. (-DD), s.n. 1569/25 NBG (BOL); Stellenbosch Div. s.n. BOL 17868 (BOL).

—3319 (Worcester): French Hoek (-CC), s.n. 1202 Univ. Gardens Stellenbosch (BOL); Stettynskloof, Worcester (-CD), *Barker* 9453 (NBG); Scherpenheuvel Vlei, (-DA), *Barker* 7516 (NBG); Boesmans Kloof Pass at McGregor (-DD), *Leipoldt* 3573 (BOL); McGregor, *Barker* 1983 (NBG).

—3418 (Simonstown): Steenberg Plateau (-AB), *Lewis* 798 (SAM); Bergvliet farm, Camp near Albertyns, s.n. SAM 90129 (SAM); Bergvliet farm (a) 3 beacons, (b) near pump, *Purcell* 151 (SAM); Bergvliet farm (a) three beacons (b) camp near Albertyns, *Purcell* s.n. SAM 90131 (SAM); Bergvliet farm, near sandpit, *Purcell* s.n. SAM 90132 (SAM); Silvermine Plateau, *Walters* 218 (NBG); Steenberg, *Barker* 3305 (NBG); Muizenberg Mt., *Barker* 4209 (NBG); Noordhoek Mt., *Compton* 14031 (NBG, BOL); Smitswinkel Flats (-AD), *Comp-*

ton 14008 (NBG); Cape Point, *Compton* 12320 (NBG); Near Klaasjagers, *Steyn* 658 (NBG, BOL); Smitswinkel Bay, *Salter* (BOL); Cape Flats (-BA), *Scott Elliot* 1189 (NBG); Cape Flats (-BA), *s.n.* 2569/34 NBG (BOL); Hottentots Holland Mts. (-BB), *Pappe s.n.* SAM 48593 (SAM); Hottentots Holland, *Pappe s.n.* SAM 48590 (SAM); Highlands, *Compton* 13489 (NBG); Highlands Est. *Lewis* 2006 (SAM); Highlands near Elgin, *Linley* (SAM); Highlands, *Leighton* 285 (BOL); Sir Lowry's Pass, *s.n.* BOL 5559 (BOL); Firgrove Flats, *Martley* (BOL); Above Kogelbay (-BD), *Barker* 3244 (NBG); Sandy flats near Pringle Bay, *Lewis* 1602 (SAM); Hangklip Convict Station, Caledon, *Barker* 3923 (NBG); Between Hangklip and Betty's Bay, *Hiemstra* 685 (NBG); Hangklip, *Loubser* 498 (NBG); Harold Porter Botanic Garden, Betty's Bay, *Ebersohn* (NBG); Road to Ou Bos, Hangklip Estate, *Leighton* 286 (BOL).

—3419 (Caledon): Houwhoek (-AA), *Zeyher s.n.* SAM 48592 (SAM); Elgin, *Compton s.n.* NBG 61846 (NBG); Zwartberg, Caledon (-AB), *Templeman s.n.* SAM 211057 (SAM); Caledon, *Loubser* 388 (BOL); Dieprivier Caledon, *Martley* (BOL); Fransche Kraal swamp (-CB), *Barker* 8501 (NBG); Between Gansbaai and Danger Point, *Stokoe* SAM 55631 (SAM); Hermanus (-AC), *Loubser* 892 (NBG); Near Elim (-DA), *Martin* 602 (NBG); Near Elim, *Barker* 5578 (NBG); Hills near Elim, *Guthrie* 3525 (BOL); Elim, *s.n.* BOL 6839 (BOL).

—3420 (Bredasdorp): The Poort, Bredasdorp (-CA), *Compton* 9030 (NBG); The Poort, Bredasdorp, *Wasserfall* 396 (NBG, BOL).

Without precise locality:

Flower show, Hermanus, *Rev. F. A. Rogers s.n.* SAM 29061 (SAM); Wild flower show, Cape Town, *s.n.* SAM 28439 (SAM); Ex Hort. Kirstenbosch *s.n.* NBG 61839 (NBG); *Zeyher s.n.* SAM 48536 (SAM); *s.n.* SAM 48538 (SAM); *s.n.* SAM 48533 (SAM); *s.n.* BOL 18469 (BOL); Cape wild flower show *s.n.* BOL 13765 (BOL); Ex Hort. Kirstenbosch *s.n.* 637/13 NBG (BOL); Ex Hort. Kirstenbosch *s.n.* BOL 17868 (BOL).

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